

SYNTE PRODUCT TECHNICAL GUIDE

VTS Multipurpose Vacuum Sintering Furnace

Selection guide for vacuum, protective-atmosphere and integrated debinding / sintering applications.

From published reference data to an application-matched furnace specification.



1300 / 2200°C

Mo / graphite maximum

4×10^{-3} Pa

Ultimate vacuum

$\pm 5^{\circ}\text{C}$

Temperature uniformity

100-800 kg

Published loading range

Use this document to

Screen the application, compare reference configurations, identify the engineering variables that change the proposal, and define measurable quotation and acceptance inputs.

Current online reference

<https://syn-v2.com/vacuum-sintering-furnace/multipurpose-vacuum-sintering-furnace/>

All published values are reference data for preliminary selection. Final configuration, supply scope and acceptance conditions are controlled by the project proposal and technical agreement.

SYNTE APPLICATION-LED ENGINEERING

01 / APPLICATION

Application fit and process boundary

Use the furnace family as a starting point. The correct configuration is determined by material, complete loaded geometry, process result, throughput and measurable acceptance evidence.

Application 01 Powder-metallurgy components	Application 02 MIM parts with optional integrated debinding
Application 03 Cemented carbide and cutting tools	Application 04 Advanced ceramics and refractory metals
Application 05 Magnetic alloys, electronic and optical components	

Typical process route

01	02	03	04	05
Prepare load	Evacuate / purge	Debind if required	Sinter	Cool & verify
Part, setter, binder and carrier definition	Pump and gas sequence	Controlled vapor release and capture	Temperature-atmosphere-time profile	Density, shrinkage, chemistry and records

Stage	Primary control	RFQ / qualification question
Prepare load	Part, setter, binder and carrier definition	Define input, control limit and evidence owner
Evacuate / purge	Pump and gas sequence	Define input, control limit and evidence owner
Debind if required	Controlled vapor release and capture	Define input, control limit and evidence owner
Sinter	Temperature-atmosphere-time profile	Define input, control limit and evidence owner
Cool & verify	Density, shrinkage, chemistry and records	Define input, control limit and evidence owner

Suitable when

The material, binder and complete loaded arrangement drive the configuration | Debinding exhaust and service access must be sized for the actual vapor load | The acceptance plan should connect cycle data to density and dimensional results

Re-check the route when

A basic furnace may be unsuitable when binder capture or contamination control is critical | Nominal chamber size without setters, clearance and carrier mass is not a usable-zone definition

02 / ENGINEERING

System architecture and sizing logic

SYNHTE reviews the furnace as a connected process system. Each subsystem is selected against the same loaded cycle and acceptance plan.

Subsystem	Engineering scope	Input that changes the choice
Process chamber	Usable zone, orientation, door/loading route and service clearances	Largest complete production load and site access
Hot zone	Heating material, insulation/shielding, zones and sensor arrangement	Temperature, chemistry, contamination and survey basis
Vacuum / gas	Pump train, valves, gauges, purge/backfill and process-gas control	Pressure range, outgassing, gas purity and cycle time
Cooling / quench	Cooling route selected around material chemistry, density result, cycle time and safe unload temperature	Target metallurgical result, load density and utilities
Handling / tooling	Tray, fixture, setter, basket, carrier or press interface	Drawing, mass, center of gravity and repeatability
Controls & records	PLC/HMI recipes, interlocks, alarms, trends and batch identity	User roles, data fields, protocols and retention
Installation	Electrical, water, gas, exhaust, floor/loading and maintenance boundary	Site utility data and local safety requirements

Four engineering decisions that should stay connected

Material chemistry Hot-zone compatibility and contamination limit	Binder/vapor Fraction, release curve, trap and cleaning duty
Load geometry Setter arrangement, gross mass and usable-zone clearance	Result Density, dimensions, shrinkage, chemistry and throughput

SYNHTE project path

Application review → configuration and utility definition → technical agreement → manufacturing and assembly → FAT / documentation → installation, SAT and process handover as agreed in the project scope.

03 / REFERENCE DATA

Published configuration envelope

VTS equipment is configured around material chemistry, binder system, load geometry, temperature requirement, gas route and acceptance evidence. Model designation is finalized after the process envelope is defined.

Selection item	Published range / option	Engineering decision
Effective work zone	300 × 300 × 450 to 800 × 800 × 1200 mm	Part, fixture/tray and production-load envelope
Reference loading	100 to 800 kg	Include trays, fixtures and setter mass
Heating power	60 to 210 kW	Matched to hot zone, load and ramp requirement
Maximum temperature	1300°C Mo / 2200°C graphite	Material chemistry and hot-zone compatibility
Vacuum	4 × 10 ⁻³ Pa ultimate	Process cleanliness, binder load and pumping route
Atmosphere	N ₂ / Ar / H ₂ / mixed gas options	Material, binder and safety requirements
Temperature performance	±5°C uniformity / ±1°C control	Qualified work zone and survey conditions
Pressure rise	0.5 Pa/h published family value	Acceptance method and test condition

How to read the table

The usable work zone must contain parts, fixtures, trays/setters, transfer clearance and the qualified sensor arrangement. Reference load is not a substitute for a gross loaded drawing. Vacuum, temperature and cooling values require an agreed test condition.

What changes the final configuration

Option / feature	Selection trigger	Engineering impact
Graphite or molybdenum hot zone	Material chemistry or contamination requirement	Changes heater/shielding compatibility and maximum useful temperature
Integrated debinding traps, condensers and filters	Pump-down, cleanliness or working-pressure target	Changes pump train, gauges, isolation and acceptance tests
Nitrogen, argon, hydrogen or mixed-gas supply	Load geometry, orientation or factory handling	Changes chamber orientation, tooling and clearances
Rotary, diffusion or molecular pumping combinations	Cooling result, cycle time or surface requirement	Changes gas/oil/water duty and heat-rejection design
Custom trays, setters and loading systems	Traceability, integration or quality-system need	Changes controls, I/O, records and FAT/SAT cases
PLC, recipe control, process curves and data records	Site utility, maintenance or safety constraint	Changes supplied auxiliaries, layout and interface scope

04 / QUALIFICATION

RFQ, proposal and acceptance framework

A precise enquiry reduces redesign and makes supplier proposals comparable. Attach drawings and define the pass/fail method wherever possible.

Input block	Information to provide	Preferred evidence
Material / process	Material/feedstock and binder composition	Drawing, value, method or standard
Part / tooling	Part, tray/setter and production-load envelope	Drawing, value, method or standard
Cycle / atmosphere	Debinding stages, mass-loss route and vapor-management need	Drawing, value, method or standard
Production	Peak temperature, atmosphere, vacuum and cooling plan	Drawing, value, method or standard
Site / utilities	Density, shrinkage, chemistry and defect acceptance	Drawing, value, method or standard
Quality / records	Throughput, utilities, safety review and data-retention requirements	Drawing, value, method or standard

Recommended acceptance evidence

Thermal

Defined survey or loaded-cycle evidence, sensor locations and allowable deviation

Vacuum / atmosphere

Pump-down, ultimate/working pressure, pressure-rise or gas condition under stated test conditions

Functional

Recipes, interlocks, alarms, manual recovery and agreed utility-loss cases

Process result

Witness-load or sample evidence using agreed hardness, leak, density, dimensional, joint or metallographic methods

Documentation

Approved drawing, utilities, manuals, component list, records and test reports in the agreed scope

Site

Installation boundary, SAT checks, training and open-item closure responsibility

Direct engineering contact

Email info@synthe-corp.com or WhatsApp +86 155 3785 7393. Include this document title and the current product page:
<https://syn-v2.com/vacuum-sintering-furnace/multipurpose-vacuum-sintering-furnace/>

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